

US EPA ARCHIVE DOCUMENT



Overview of Microbial Risk Assessment Activities in EPA's Office of Research and Development

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ORD Organization

- National Health and Environmental Effects Research Laboratory
- National Exposure Research Laboratory
- National Risk Management Research Laboratory
- National Center for Environmental Assessment
- National Center for Environmental Research
- National Homeland Security Research Center
- National Center for Computational Toxicology



ORD Research on Microbial Risks

- Risk assessment/risk management paradigm
- Research encompasses continuum
 - Source
 - Risk management
 - Exposure
 - Health outcomes
 - Regulatory issues
- Research Challenges
 - Dose-response
 - Relationships between indicators and pathogens
 - Use of risk assessment for risk management



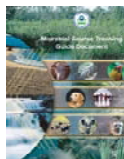
Examples of ORD Research Questions for Drinking Water

- Impacts of alternative disinfection (e.g. chloramination) on microbial ecology/pathogen distribution, microbial risk
- Impacts of water distribution system management practices—chlorination, flushing, etc.—on microbial risk?
- Risk assessment for sensitive populations
- Trends of alternative pipe materials—impacts on microbial risk



Research Progress Highlights

- Pathogens
 - Proteomics-based approach for characterizing drinking water pathogens
 - Improved method(s) for Mycobacterium paratuberculosis, rotavirus, hepatitis E virus, pathogenic fungal species
 - Method for characterizing human exposure to mycobacteria
 - Characterization of the virulence of bacteria in biofilms and/or cooling towers; Includes methods to distinguish virulent and avirulent isolates



Research Progress Highlights

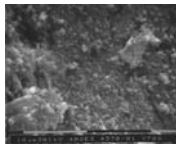
- Contribution of enterohemorrhagic Escherichia coli (EHEC) in watersheds from wastewater effluents
- Evaluation of conferred antibiotic resistance in microbial communities resulting from pharmaceuticals and personal care products
- Improved methods to measure concentrations of *Cryptosporidium* spp. and *Giardia* spp. in source waters





Research Progress Highlights

- Ultraviolet irradiation for pathogen inactivation
- Cost and performance evaluations for advanced oxidation processes (e.g., ozone/UV/hydrogen peroxide combinations) to control pathogens in small drinking water systems
- Evaluation of conferred antibiotic resistance in microbial communities resulting from pharmaceuticals and personal care products



STAR Grants

- Key areas:
 - Methods development
 - Epidemiology studies
- In 2005 STAR Grants Total Over \$5.8M
- Examples:
 - Simultaneous Concentration and Real-time Detection of Multiple Classes of Microbial Pathogens from Drinking Water
 - On-chip PCR, Nanoparticles, and Virulence/Marker Genes for Simultaneous Detection of 20 Waterborne Pathogens



Examples – 2007 STAR Grants

- Fiber Optic Array System for Detection and Enumeration of Potentially Toxic Cyanobacteria
- Assessment of Microbial Pathogens using Molecular Methods with Solid Phase Cytometry
- Selective Field-Deployable Biosensor for Cyanotoxins and Cyanobacteria using Antibodies and DNA-Signatures
- Automated Quantification and Infectivity of Human Noroviruses in Water
- Rapid Concentration, Detection, and Quantification of Pathogens in Drinking Water



Dose Response Characterization in Susceptible Populations and Life Stages

EPA Risk Assessment Forum Workshop (Feb 2007)

- Colloquium on immunotoxicity & lifestage impacts on dose response to environmentally derived pathogens
- Multidisciplinary approach
- Data needs
- Address regulatory needs: immunotoxicology and microbial risk assessment guidance



EPA Risk Assessment Forum – Development of MRA Guidance

- Technical review of Office of Water's MRA protocol and thesaurus of terms/definitions
- Evaluation of existing MRA Frameworks
- Development of MRA risk communications procedures
- Major involvement in Interagency MRA guidelines development efforts



Anticipated Outcomes of EPA Activities

- Interagency guidance - Greater consistency in MRA
- Bridge key data gaps in characterizing microbes using advanced methods and innovative approaches
- Better understanding of susceptible populations and life stages
- Informed planning
- Prioritized research initiatives
- More transparent regulatory decisions